STATE OF ALASKA

*Jay S. Hammond, Governor*


Annual Performance Report for

# INVENTORY AND CATALOGING OF SPORT FISH AND SPORT FISH WATERS OF BRISTOL BAY AREA

by

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RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations of Alaska

Project No.: F-9-11

Study No.: G-I Study Title: INVENTORY AND CATALOGING

Job No.: G-I-E Job Title: Inventory and Cataloging of Sport Fish and Sport Fish Waters of Bristol Bay Area.

Period Covered: July 1, 1978 to June 30, 1979.


ABSTRACT

The Bristol Bay area includes all waters flowing into Bristol Bay from Cape Newenham to Port Heiden. Research activities in the area are designed to monitor traditional fisheries and to expand studies into development of potentially important sport fisheries.

The 1978 Naknek River sports harvest of chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), was estimated to be 2,406 fish, with an escapement of over 9,000 in the drainage.

Rainbow trout, *Salmo gairdneri* Richardson, surveys were made on Copper River, Lower Talarik Creek, and Dream Creek in the Kvichak drainage and in the Brooks River, a tributary of the Naknek system. An estimate was made of 284 rainbows kept from Naknek River rainbow trout harvested between mid-August and early October. Average lengths of fish caught and kept are presented.

A 4-day creel census was conducted at Lower Talarik Creek during the peak of the fishery. Anglers caught 177 rainbow trout, with only 8 retained.

Arctic grayling, *Thymallus arcticus* (Pallas), were surveyed at the Lower Ugashik Lake outlet between August 1 and August 5 and a total of 198 grayling were measured and tagged. Average lengths are presented and a comparison to a similar 1971 sample is made.

Seventeen ground surveys and two aerial surveys of waters proposed for inclusion into the Lake Clark National Park and Preserve were conducted during the 1977 summer. Sport fish species and their size characteristics are presented by lake or river.

## BACKGROUND

The Bristol Bay area includes all waters flowing into Bristol Bay from Cape Newenham to Port Heiden (Fig. 1). The area contains some of the best recreational fishing waters within the State. While the Kvichak and Naknek drainages have traditionally been sport fished for many years, there is still the opportunity for expansion of the recreational fishery into Bristol Bay area waters unknown to the general public. Many of the professional fishing guides and anglers with airplanes are currently moving into these areas.

In 1977 the Sport Fish Division of the Alaska Department of Fish and Game conducted basic fishery inventories within the Mulchatna River drainage. However, for many of the larger lakes and rivers within the proposed Lake Clark National Park and Preserve, fisheries information on file was limited to scattered reports of local fishing success by anglers and guides.

With (d)(2) lands legislation pending, the inadequacy of resource information pertaining to fisheries in the Lake Clark area was apparent. A two year inventory study was initiated in 1978 to provide the necessary information. 'This project was jointly funded by both the State of Alaska and the National Park Service.

An estimate of the 1978 chinook salmon catch and escapement was made for comparisons to previous years. A creel census estimate of rainbow trout harvested by sport anglers at Lake Camp on the Naknek River was made between mid-August and early October.

Rainbow trout spawning surveys were conducted on selected streams in the Kvichak and Naknek drainages to estimate the number of spawning rainbow trout and to determine the minimum number of large rainbow trout available to anglers.

Table 1. presents common and scientific names of species mentioned in this report.

## RECOMMENDATIONS

1. The formal Naknek River chinook salmon creel census should be continued during 1979 to determine sport harvest and effort.

2. The enumeration of chinook salmon and rainbow trout in selected streams in the Naknek and Kvichak drainages should continue in order to establish a minimum spawning escapement.

3. A population estimate of Arctic grayling at Lower Ugashik Lake outlet should be attempted.

4. The survey of selected streams within the Bristol Bay area to determine the existence of, or the potential for, a recreational fishery should be continued.

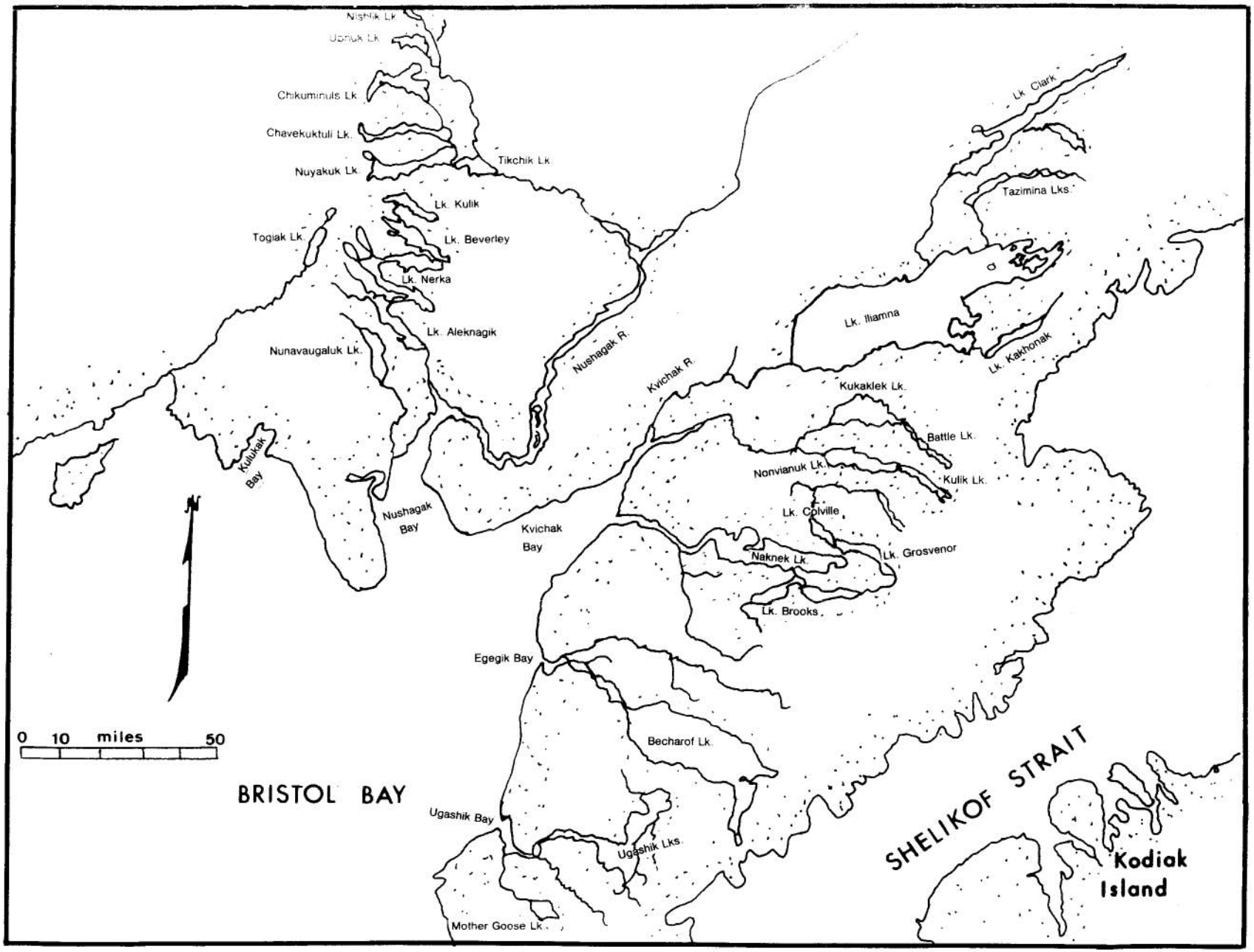


Figure 1. Study Area.

Table 1. List of Common and Scientific Names.

| Common Name | Scientific Name and Author |
|---|---|
| Chinook salmon | *Oncorhynchus tshawytscha* (Walbaum) |
| Chum salmon | *Oncorhynchus keta* (Walbaum) |
| Coho salmon | *Oncorhynchus kisutch* (Walbaum) |
| Sockeye salmon | *Oncorhynchus nerka* (Walbaum) |
| Rainbow trout | *Salmo gairdneri* Richardson |
| Lake trout | *Salvelinus namaycush* (Walbaum) |
| Arctic char | *Salvelinus alpinus* (Linnaeus) |
| Dolly Varden | *Salvelinus malma* (Walbaum) |
| Arctic grayling | *Thymallus arcticus* (Pallas) |
| Northern pike | *Esox lucius* Linnaeus |
| Burbot | *Lota lota* (Linnaeus) |

## OBJECTIVES

1. To determine the distribution and utilization of sport fish species within the waters of the job area, with emphasis on the proposed Lake Clark National Park and National Preserve.

2. To determine the magnitude of rainbow trout spawning stocks in Lower Talarik Creek, Dream Creek, Copper River, Naknek River, Brooks River, and other streams as time permits.

3. To determine the magnitude of chinook salmon spawning stocks utilizing the Naknek River drainage.

4. To determine the sports harvest of chinook salmon and fall rainbow trout in the Naknek River.

5. To provide recommendations and identify future research needs relative to the management of area sport fish resources.

## TECHNIQUES USED

The 1978 Naknek River chinook salmon creel census is a modification of the 1975 census (Gwartney, 1976). It was designed to estimate the sport catch of chinook salmon on the Naknek River between June 1 and July 17 (Fig. 2). In addition, data were collected to estimate fishing effort, angler status, and age composition of chinook salmon retained. The census required the full time effort of one man working 6 to 12 hours per day, 5 days a week.

Three time periods were selected to sample. These were:

| | | |
|---|---|---|
| 6 a.m. | - | 12 noon |
| 12 noon | - | 6 p.m. |
| 6 p.m. | - | 12 midnight |

To eliminate bias created because fishing effort was expended during afternoons and on weekends, census periods were randomly assigned to the days between June 1 and July 17. During each time period, two counts of fishermen were made by boat. Between June 1 and June 24 counts were restricted to the river between FAA Rock and Smelt Creek. After June 24, an additional area upstream to the mouth of Big Creek was included (Fig. 2). Before and after each count, an attempt was made to contact each fisherman returning to one of the local docks. Each fisherman was interviewed, and his fish were measured. Scales were taken from bright chinooks for age analysis.

The 1978 Naknek River rainbow trout creel census was similar to the chinook salmon census. It was designed to estimate the number of rainbow trout

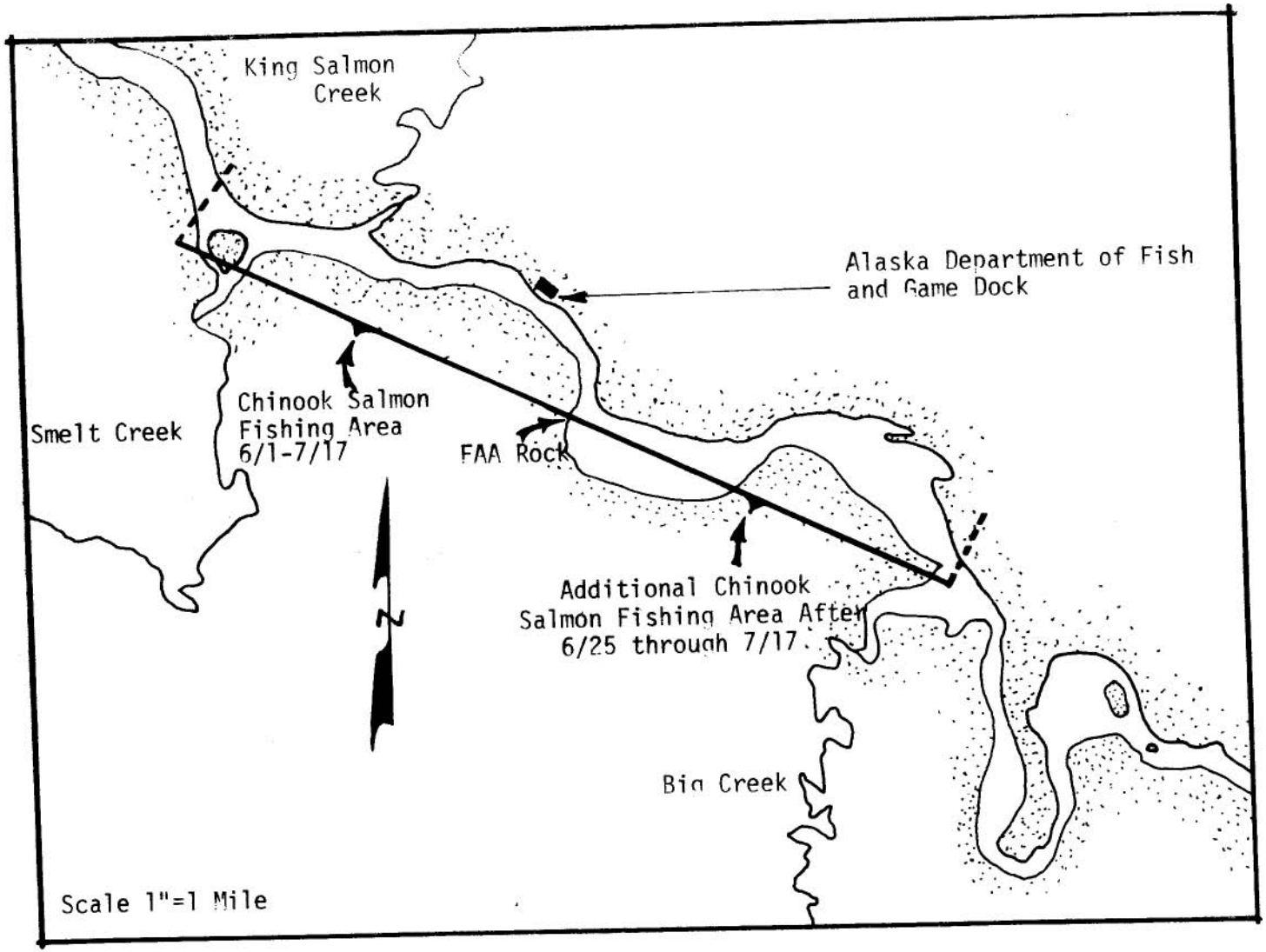


Figure 2. Naknek River at King Salmon, Alaska, Showing Chinook Salmon Creel Census Area, 1978.

caught and kept from the Naknek River between Trefon's cabin and Production Point between the dates of August 12 and October 1 [Fig. 3). In addition, data were collected to estimate angler effort and size of rainbow trout, grayling, and char retained. This census required the full time effort of one man working 4 to 8 hours a day, 5 days a week.

Using the same assumptions as in the chinook survey, three time periods were selected to sample. These were:

| | | |
|---|---|---|
| 8 a.m. | - | 12 noon |
| 12 noon | - | 4 p.m. |
| 4 p.m. | - | 9 p.m. (until Sept. 9) then 8 p.m. |

During each time period, one count of fishermen was made by boat between Trefon's cabin and Production Point. Before and after each count, an attempt was made to contact each fisherman returning to Lake Camp after his days' fishing was completed. Each fisherman contacted was interviewed and his fish measured.

All data collected from both censuses were sent to Anchorage for expansion by the division biometrician.

Numbers of chinook salmon were estimated by aerial surveys. An observer flew each tributary near the peak of spawning and estimated numbers of spawning chinook salmon. Chinook salmon were estimated in tens or hundreds in areas of large concentrations.

Spawning ground counts for rainbow trout were obtained by walking along the banks and observing the fish or by aerial surveys similar to the chinook salmon counts.

In the Lake Clark studies, fish were captured using gill nets, dip nets, hook and line, minnow traps, and a backpack electroshocker. Gill nets were of three types:

A. 125 foot long, variable mesh monofilament diving net, 6 feet deep, comprised of five 25-foot panels bearing mesh sizes 1/2 inch, 3/4 inch, 1 inch, 1 1/2 inch, and 2 inches, respectively (mesh size = square measure).

B. 125 foot long, variable mesh nylon floating net, 6 feet deep, comprised of five panels bearing mesh sizes as above.

. 75 foot long, monof'ilament floating net, 10 feet deep, 4 inch mesh.

The electroshocker used for fish collection was a Smith-Root, Type V, 2v, backpack electrofisher. Fish captured were identified to genus in he field or preserved in 10% formalin solution for later identification in the laboratory. All fish were measured to the nearest millimeter (both standard fork length and total length), weighed to the closest half-ounce, and examined internally to determine sex and stage of maturity. Scales, otoliths, and opercular bones were removed, depending on the species

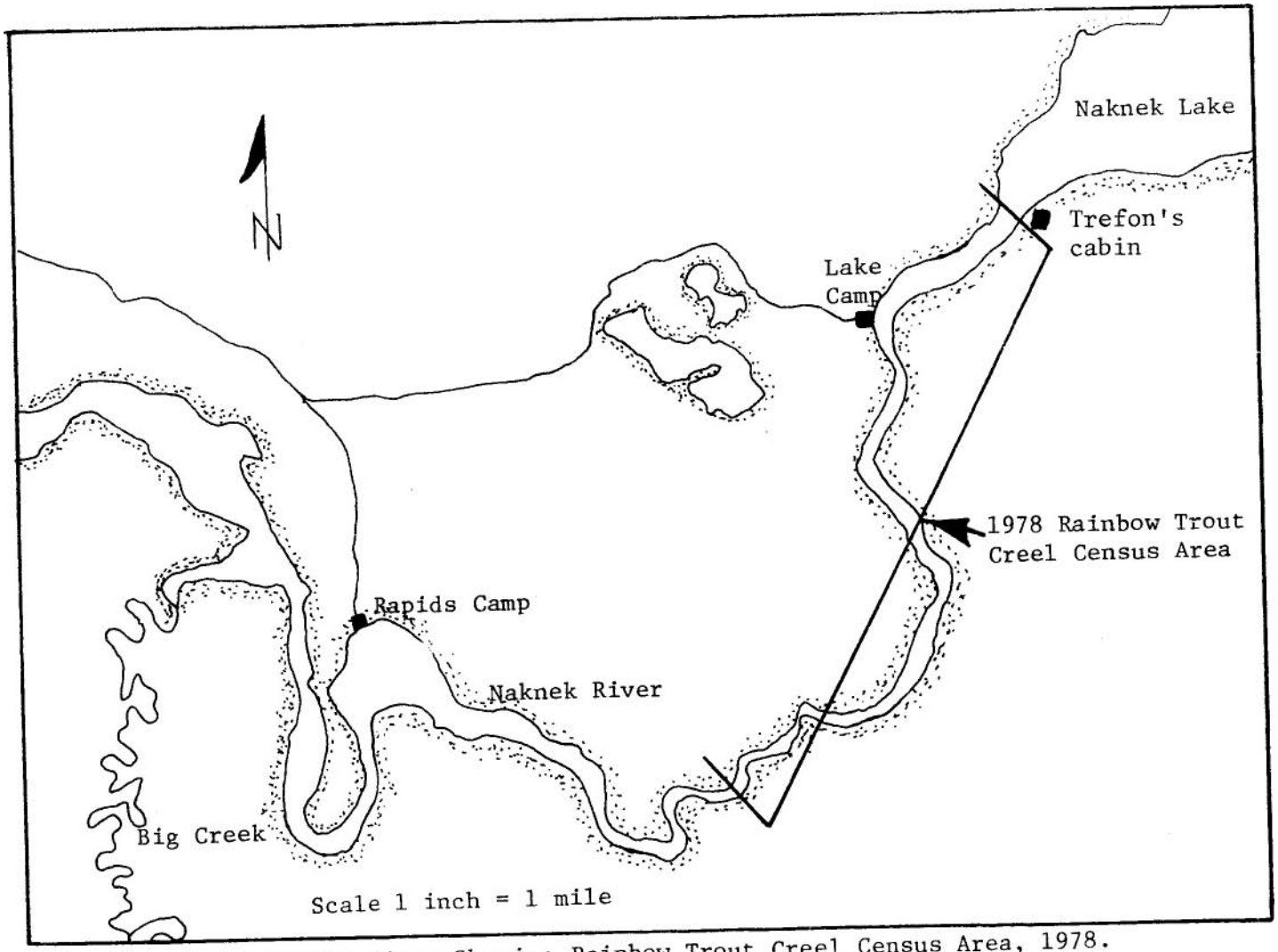


Figure 3. Upper Naknek River Showing Rainbow Trout Creel Census Area, 1978.

sampled, to be used in age analysis. Stomachs were removed from selected individuals and preserved in 10 percent formalin for later contents analysis.

Water samples were collected at a depth of four meters using a Nansen-type bottle. Samples were analyzed for alkalinity, dissolved oxygen, pH, and total hardness, using a Hach Model AL-36B water chemistry kit.

Water depths were determined using a line and weight, and water transparency was checked, using a secchi disc.

Arctic grayling were tagged with numbered, brown FD-67 internal anchor tags made by the Floy Tag Company. The tags were inserted with Dennison Mark II tagging guns into the dorsal body musculature so that the anchor section of the tag lodged between consecutive pterygophores.

## FINDINGS

### Results

Naknek River Chinook Salmon:

The 1978 Naknek River chinook salmon sport harvest in the river section between Smelt Creek and Big Creek was 2,406 salmon. Total angler days expended were 5,042 and total angler hours were 18,668. Just over two angler days effort were expended for each chinook salmon retained. Forty-two percent of the anglers checked were resident and fifty-eight percent were non-residents. Sixty-one percent were civilians, while thirty-nine percent were military fishermen. Table 2. presents age and average length composition for 229 chinook salmon scales collected from bright fish. Figure 4 presents a length frequency for all salmon measured by sex.

Chinook salmon escapement estimates for the Naknek River system are presented in Table 3. Further, estimates of catch (including subsistence) and escapement for chinook salmon in the Naknek drainage are also presented in Table 4.

Rainbow Trout Surveys:

Rainbow trout spawning surveys were again conducted in April and May, 1978, in selected index streams in the Naknek and Kvichak drainages. These surveys, continuous since 1972, (Table 5) provide an annual comparison of the numbers of large rainbow:; available to spawn and subsequently to the angling public. Since most large rainbow trout spend most of the summer associated with the lake environment, these spring surveys are the only time visual observation of their numbers is possible.

Efforts at Lower 'Ialarik Creek were restricted to spring spawning counts of rainbow trout ('Table 5) and 4 1/2-day creel censuses between September 18 and September 22. During this time, 46 anglers caught 177 rainbows, only eight of which were retained. In addition, 201 Arctic grayling, were caught

Table 2. Age and Length Composition of 229 Chinook Salmon Collected From The Naknek River Sport Fishery, 1978.

| Age | Sex | Sample Size | Average Fork Length (mm) | Standard Deviation (mm) |
|---|---|---|---|---|
| 1.1 | Male | 50 | 433 | 25 |
| | Female | 0 | --- | -- |
| 1.2 | Male | 31 | 580 | 75 |
| | Female | 0 | --- | -- |
| 1.3 | Male | 35 | 817 | 71 |
| | Female | 16 | 843 | 66 |
| 1.4 | Male | 38 | 981 | 84 |
| | Female | 56 | 969 | 54 |
| 1.5 | Male | 0 | --- | -- |
| | Female | 3 | 990 | 23 |

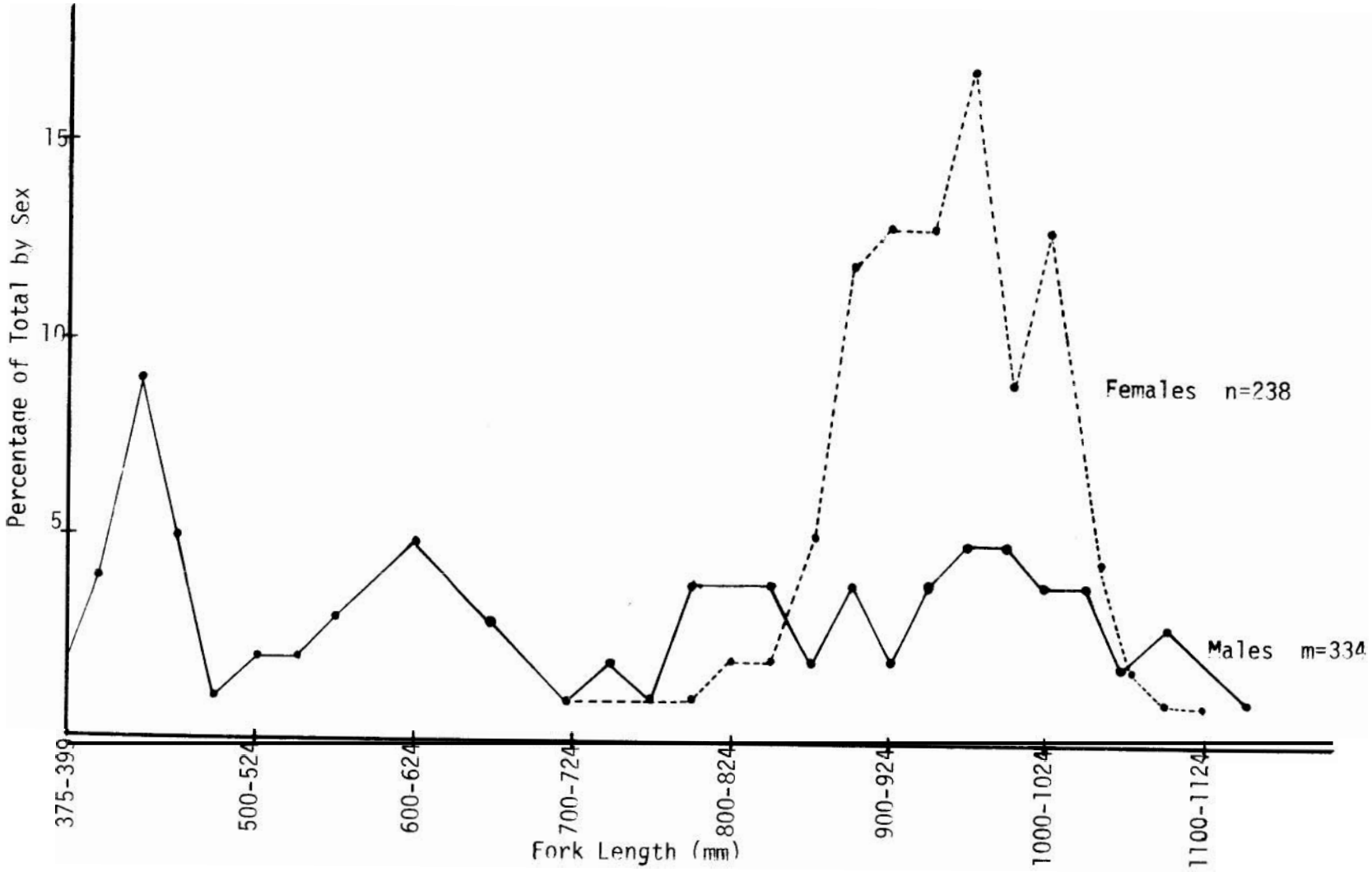


Figure 4. A Length Frequency of 572 Sport Caught Chinook Salmon in the Naknek River, 1978.

Table 3. Chinook Salmon Escapement Estimates, Naknek River System, 1970-1978.*

| Year | King Salmon Creek | Big Creek | Pauls Creek | Mainstream Naknek River | Estimated Total (Mid-Point) |
|---|---|---|---|---|---|
| 1970 | 260 | 1,600 | No Count | 2,000 | 4,360 |
| 1971 | 740 | 490 | 52 | 1,120 | 2,902 |
| 1972 | 1,224 | 1,060 | 156 | 351 | 2,791 |
| 1973 | 115 | 1,106 | No Count | 1,300-1,600 | 2,671 |
| 1974 | 600-800 | 1,200-1,300 | 250 | 400-500 | 2,650 |
| 1975 | 350-400 | 800-850 | 200-250 | 2,250-2,350 | 3,925 |
| 1976 | 350-450 | 1,300-1,500 | 75-125 | 7,000-7,500 | 9,150 |
| 1977 | 2,200-2,500 | 2,600-2,800 | No Count** | 5,500-6,000 | 10,300 |
| 1978 | 250-350 | 4,600-5,000 | 200-300 | 3,000-5,000 | 9,350 |

*Aerial Surveys
**High Water

Table 4. **Estimated Harvest and Escapement of Chinook Salmon in the Naknek River System, 1970-1978.**

| Year | Estimated Sports Catch | Estimated Subsistence Harvest | Estimated* Escapement | Totals (Exclusive of Commercial Harvest) |
|---|---|---|---|---|
| 1970 | 2,730*** | 300 | 4,360 | 7,390 |
| 1971 | 2,417*** | 200 | 2,866 | 5,483 |
| 1972 | 1,668*** | 400 | 2,791 | 4,859 |
| 1973 | 1,000 | 600 | 2,671 | 4,271 |
| 1974 | 1,700 | 900 | 2,650 | 5,250 |
| 1975 | 427*** | 600 | 3,925 | 4,952 |
| 1976 | 800 | 700 | 9,150 | 10,650 |
| 1977 | 1,000 | 1,200 | 10,800 | 13,000 |
| 1978 | 2,406*** | 1,100** | 9,350 | 12,856 |

* Includes all tributary streams surveyed.
** Preliminary.
*** Estimate based on a formal creel census..

Table 5. A Summary of Rainbow Trout Spawning Surveys Made on Streams in the Naknek and Kvichak Drainages, 1972-1978.

| Stream | Number of Rainbow Trout | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 |
| Copper River | 630 | 102 | 91 | 85 | * | 400-500 | 250-350 |
| Brooks River | No Survey | 150 | 169 | 88 | 100 | 125-175 | 125-150 |
| Lower Talarik Creek | *600* | 1,000 | 1,200 | 1,100 | 1,000 | 800 | 1,100-1,200** |
| Dream Creek | No Survey | 218 | 43 | 46 | 200-250 | 138 | 175-225 |

* No count possible due to turbid waters.
** Aerial survey.

of which 3 were kept. At least 450 large rainbows were present between the old weir site and the mouth on September 22. This is a distance of approximately one mile.

The 1978 Naknek River rainbow trout creel census produced an estimate of 847 trout caught and 284 trout kept between ,August 12 and October 1. Anglers expended an estimated 1,896 hours, or 755 angler days, during this period. Table 6 presents length data collected from fish retained by anglers during the August 12 through October 1 creel census.

Lower Ugashik Lake Outlet Grayling Survey:

Between August 1 and August 5, 198 Arctic grayling were captured by hook and line, measured, tagged, and released at Ugashik Lake outlet.

Figure 5 presents a length frequency of grayling measured, showing both the fork and total lengths. Average lengths and standard deviations for the sample were as follows:

| | Average | Standard Deviation |
|---|---|---|
| Total length | 453 mm | 39 mm |
| Fork length | 421 mm | 37 mm |

Figure 6 compares length samples taken in 19'71 and those of 1978. With only minor differences in sampling time and sample sizes, the surveys could be considered identical (Siedelman, 19'72). Between August 1 and August 7, six anglers were observed, three of which were fishing for Arctic char or salmon. In addition to the abundant grayling, Arctic char to 10 pounds, sea run Dolly Varden, and lake trout, all species of salmon were available to the angler at Ugashik Lake outlet.

Catalog and Inventory Surveys in the Proposed Lake Clark National Park:

Figure 7 presents the proposed Lake Clark National Park boundaries with the major lakes and streams surveyed in 1978 depicted. Table 7 presents the areas which were surveyed, survey dates, sport fish species present, and their respective length ranges. In the 1979-1980 report more detailed information will be presented, including limnological data, access, and angler use for each body of water, as well as age and growth, and stomach analysis, of all indigenous species. This information is not available at this time as "end of season" data analysis is only now occurring.

## DISCUSSION

The 1978 Naknek River chinook salmon creel census documented the major chinook salmon sport fishery in Bristol Bay. The dramatic increase in effort and catch was due both to increased nonresident participation and an exceptionally large chinook salmon run into the system. Not since 1971 has harvest of over 2,000 sports caught chinook been estimated.

ble 6. Sample Sizes, Mean Lengths, and Standard Deviations of Fish Retained by Anglers from the Naknek River Between August 12 and October 1, 1978.

| | Rainbow Trout | Arctic Char | Arctic Grayling |
|---|---|---|---|
| Sample Size | 55 | 10 | 13 |
| Mean Total Length (mm) | 484 | 376 | 392 |
| Mean Total Length (inches) | 19 | 15 | 15 |
| Standard Deviation (mm) | 150 | 67 | 48 |
| Standard Deviation (inches) | 6 | 3 | 2 |
| Percent over 510 mm (20 inches) | 30 | | |

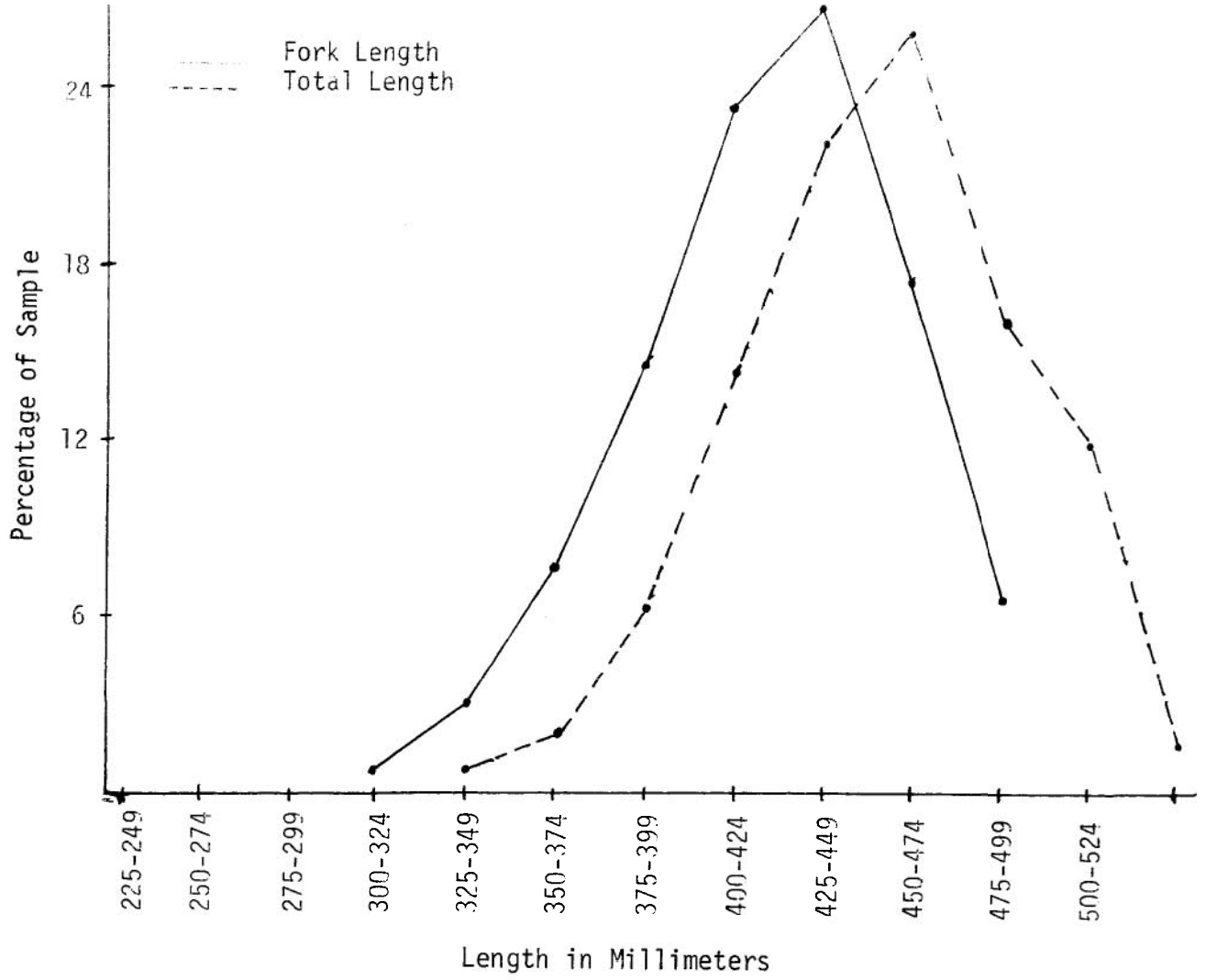


Figure 5. A length-frequency of Arctic Grayling from Ugashik Outlet presenting both fork and total lengths, August 1-5, 1978.

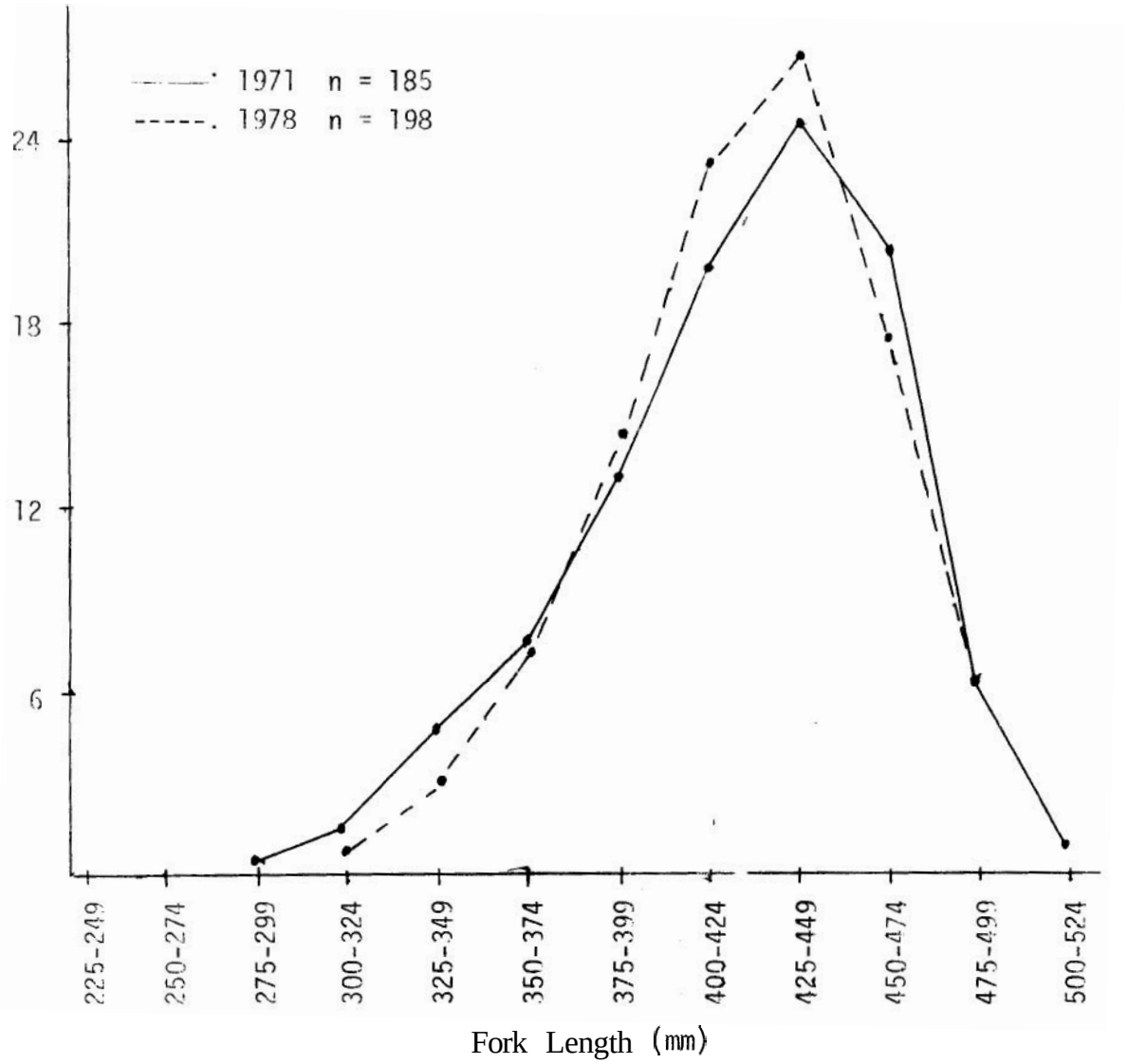


Figure 6. Length-frequencies of Arctic Grayling from Ugashik Outlet comparing samples taken in 1971 and 1978.

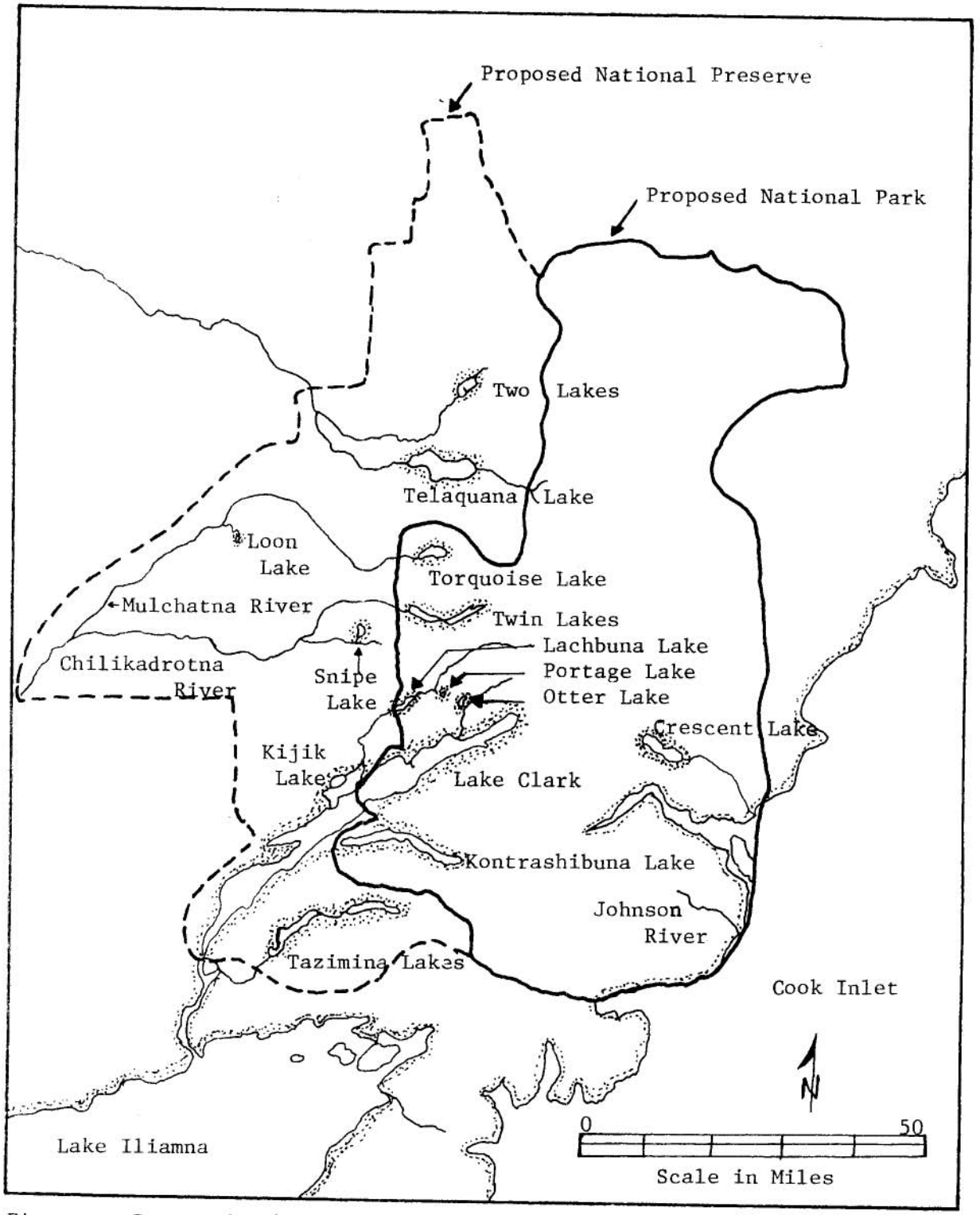


Figure 7. Proposed Lake Clark National Park and Preserve Showing Lakes and Rivers Surveyed in 1978.

Table 7. Lake and River Survey Data Collected from the Proposed Lake Clark National Park and Preserve, 1978.

| Lake or River | Date | Species Captured | Number Captured | Fork Length Range (mm) |
|---|---|---|---|---|
| Lake Clark | June 5-9 | Lake trout | 30 | 410-635 |
| | July 3 | Grayling | 21 | 135-397 |
| | Aug 27 | Northern pike | 6 | 193-735 |
| | | Char | 1 | -312 |
| | | Burbot | 3 | 470-597 |
| Johnson River | June 13 | Char | 6 | 52- 79 |
| | | Coho | 34 | 35- 63 |
| | | Chinook | 1 | 55 |
| | | Chum | 1 | 32 |
| Crescent Lake | June 20-21 | Lake trout | 29 | 190-565 |
| | | Char | 45 | 46-548 |
| | | Chinook | 2 | 121-125 |
| | | Sockeye | 20 | 28- 40 |
| Kijik Lake | June 24-26 | Lake trout | 5 | 423-472 |
| | | Char | 28 | 32-580 |
| | | Grayling | 13 | 286-385 |
| | | Sockeye | 10 | 28- 36 |
| Two Lakes | July 3-5 | Lake trout | 3 | 381-504 |
| | | Char | 5 | 61- 71 |
| | | Northern pike | 17 | 524-834 |
| | | Sockeye | 23 | 30-701 |
| Telaquana Lake | July 11-15 | Lake trout | 20 | 408-536 |
| | | Char | 4 | 71-296 |
| | | Northern pike | 19 | 69-908 |
| | | Sockeye | 18 | 27-604 |
| | | Chum | 1 | -668 |
| Snipe Lake | July 18-22 | Lake trout | 6 | 404-526 |
| | | Char | 7 | 53-559 |
| | | Grayling | 65 | 32-351 |
| | | Coho | 20 | 38- 51 |
| | | Chinook | 3 | 61- 62 |
| | | Burbot | 2 | 143-345 |

Table 7. (cont.) Lake and River Survey Data Collected from the Proposed Lake Clark National Park and Preserve, 1978.

| Lake or River | Dale | Species Captured | Number Captured | Fork Length Range (mm) |
|---|---|---|---|---|
| Twin Lakes | July 31-Aug. 3 | Lake trout | 62 | 241-470 |
| | | Char | 52 | 37-545 |
| | | Grayling | 8 | 179-405 |
| | | Sockeye | 8 | 31-698 |
| | | Burbot | 4 | 334-500 |
| Turquoise Lake | Aug. 6-9 | Lake trout | 41 | 76-468 |
| | | Char | 8 | 41-148 |
| | | Grayling | 10 | 130-378 |
| | | Burbot | 5 | 236-395 |
| Mulchatna River | Aug. 10-13 | Char | 20 | 41-113 |
| | | Grayling | 6 | 328-406 |
| | | Coho | 12 | 47- 93 |
| | | Chinook | 8 | 64- 83 |
| | | Burbot | 5 | 92-109 |
| Loon Lake | Aug. 14-15 | Northern pike | 26 | 230-632 |
| | | Grayling* | -- | --- |
| | | Sockeye* | -- | --- |
| Kontrashibuna Lake | Aug. 22-25 | Lake trout | 67 | 199-548 |
| | | Char | 67 | 57-496 |
| Portage Lake | Aug. 31-Sept. 1 | Lake trout | 29 | 168-542 |
| | | Char | 44 | 62-517 |
| Lachbuna Lake | Sept. 3-4 | Lake trout | 24 | 223-679 |
| | | Char | 41 | 121-440 |
| Tazimina Lake | Sept. 8-13 | Char | 246 | 43-434 |
| | | Grayling | 70 | 118-402 |
| Chilikadrotna River | Sept. 17-22 | Char | 5 | 142-505 |
| | | Rainbow trout | 35 | 231-550 |
| | | Grayling | 25 | 269-413 |
| | | Coho | 2 | 53- 88 |
| | | Chinook | 31 | 54- 80 |

"Observed but not captured.

The large number of chinook scales and fish lengths collected enabled a breakout of age and length by sex. Females were predominately 4-ocean age fish, with only a few 3 and 5-ocean age fish caught. Males were of all ages from 1 through 4, with approximately 25 percent under 71 cm (28 inches) in length (jack salmon).

In addition to the estimate of 2,406 salmon kept, an unknown number were retained from upper Pauls Creek. This fishery is accessible by car and boat and, therefore, isn't reflected in the boat census. I would estimate this additional catch to be around 100 chinooks, weighed heavily to jacks.

Similar to 1977, the Naknek River chinook season started earlier than normal with the first chinook landed from the lower river during mid-May. The intensity of angler effort by the military was similar to that of 1977. This year an additional guide started work on the Naknek River, making a total of two.

The 1978 estimated escapements for King Salmon Creek and Pauls Creek (Table 3) are extremely conservative since aerial surveys were flown well after the peak of spawning. Similar to Big Creek, I think near record runs occurred in both streams.

Rainbow trout spawning surveys for 1978 were similar to 1977 (Table 5). Copper River had approximately 100 fewer fish than in 1977 but significantly better than the period 1973 through 1975. Lower Talarik Creek was filled with large rainbows and a greater number were observed than at anytime during the last seven years.

The 1978 Naknek River rainbow trout harvest estimates, in the area between Trefon's cabin and Production Point, of 284 fish is considered to be 50 percent of all rainbows kept during the year. This level of harvest seems minimal and certainly not harmful to the rainbow trout population.

Table 6 further demonstrates a rainbow trout population with large fish (484 mm) available to the angler. Thirty percent of the rainbows retained were over 510 mm (20 inches) in total length. The largest caught and released by a Department employee was 825 mm in total length, while an angler is known to have kept a rainbow trout 832 mm long. The largest Naknek River rainbow entered in the Department's Trophy Fish Program in 1978 was 6.8 kg (15 pounds).

The Arctic grayling population at Ugashik outlet appears stable and probably not very different from an unfished population. Based on length-weight information collected in 1971, the average grayling in 1978 (421 mm in length) weighed 1 kg (2 1/4 pounds). Twenty-three percent of our samples weighed 1.25 kg (2 3/4 pounds) or more and 6 percent were over 1.36 kg (3 pounds). Although we fished the same general area during the entire sampling period, we only caught 15 of the 198 fish we previously tagged, indicating a large population of grayling available to the angler. Through October, 1978, no tags had been returned by anglers. In 1979 a follow-up trip is planned to attempt to recover tagged Arctic grayling released in 1978 and, if possible, estimate the population size of grayling available to the sport fishery.

Seventeen ground surveys and two aerial surveys of waters proposed for inclusion in Lake Clark National Park and Preserve were conducted between June 2 and September 28. Fish species were found to be present at each locality surveyed. Approximately 2,150 fish were sampled. Data analysis is now proceeding and will be presented in final form by April, 1980.

## LITERATURE CITED

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